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DEVELOPMENT OF A GSM BASED SYSTEM TO CONTROL AND MONITOR SOIL MOISTURE LEVEL FOR IRRIGATON PROCESS

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ABSTRACT

Irrigating plants with proper amount of water is one of the tedious and most important part of irrigation process, and for the country like India where major part of our economy depends on agriculture. Having proper soil moisture content is one of the important factors for healthy crops yield. In this paper we proposed a system which will able to wirelessly monitor the soil moisture level and thus control the irrigation water pump according to the level of moisture present in the soil without any human intervention. This system is developed with microcontroller, moisture sensor, GSM and the motor. This project helps the illiterate farmers to water the fields properly hence resulting proper crops yield.

KEYWORDS: Irrigation, GSM, Microcontroller, Moisture Sensor

INTRODUCTION

The monitoring and controlling of irrigation system using GSM (global standard for mobile communication) modem offers us the flexibility to control the irrigation of the agricultural fields with little intervention to reduce runoff from over watering in crops yield. Usually farmers need to walk a long distance up to the irrigation field to monitor the field and turn on the irrigation water pump. Many work have been done in the past related to automation of irrigation systems, some of the past works are, related to the development of systems which uses Single Board Computer (SBC) using Linux operating system to control the solenoids connected to nozzle [I], while there are the other systems which uses capacitive sensor and GSM to control the water flow in fields [II]. In this paper we have worked on controlling the irrigation pump by comparing the moisture level present in the soil to the required threshold moisture level. Proposed System basically divides into two parts; base station and the nodes. Base station consists of a microcontroller which is connected to the GSM & similarly at nodes also we have microcontroller which is connected to GSM, moisture sensor and irrigation pump. Whenever moisture quantity varies in any particular node, moisture senor senses it and communicates it to connected microcontroller which further transfers the information to base station with the help of GSM. At base station microcontroller compare the received information with the stored database and accordingly send the commands to respective nodes with the help of GSM and which then either turn on or turn off the irrigation pump. Base station also send message to the user about the irrigation pump status.

SYSTEM BLOCK DIAGRAM

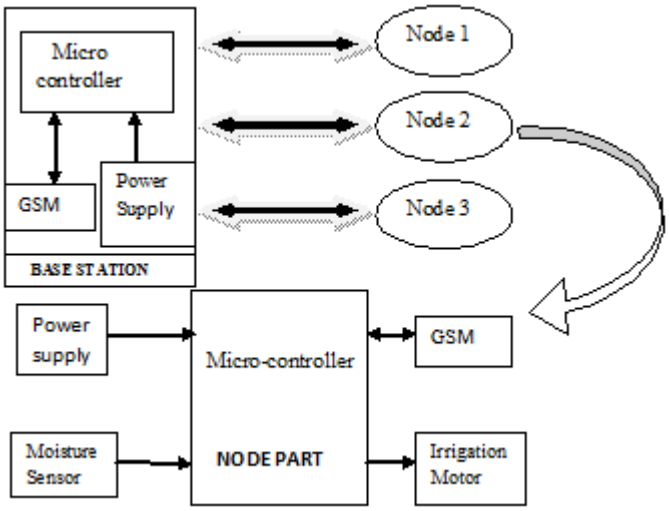

Figure 1: Block Diagram of the System

HARDWARE DEVELOPMENT

Power Supply Module

This module converts the 220v/50 Hz A.C to 5v,500mA.It consists of step down transformer to step down unregulated ac voltage to regulated DC 5V/500mA, 1N4007diode for rectifying purpose,1000uf/35V electrolytic capacitor as a filter,, 7805 regulated IC, 330Ω resistor, and 5mm red Led for indication purpose.

GSM

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. A GSM modem must support an “extended AT command set” for sending/receiving SMS messages. The GSM module we have used here is SIM 300.Which is a tri-band GSM/GPRS engine that works on frequencies EGSM 900 MHz, DCS 1800 MHz and PCS1900 MHz, Some of the basic AT command are given below

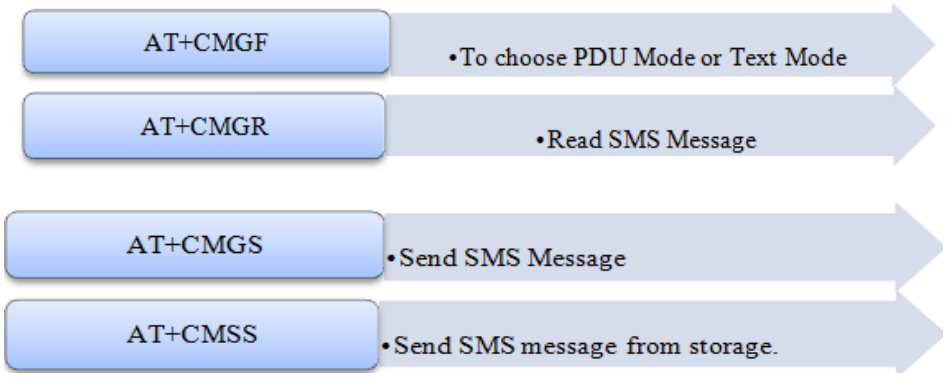

Figure 2: AT Commands

Atmega 16 Microcontroller

Atmega 16 is an 8 bit high performance of Atmel's Mega AVR family with low power consumption. Atmega16 can work on a maximum frequency of 16MHz. It has 512 bytes EEPROM, 1K byte SRAM. It has 32 general purpose input/output lines. And 8 channel 10 bit ADC.

Soil Moisture Sensor

Sensor measures the dielectric constant of the soil in order to find its volumetric water content. It has a working voltage of 3v-5v regulated dc. In addition, the sensors incorporate a high frequency oscillation, which allows the sensor to accurately measure soil moisture in any soil with minimal salinity and textural effects.

LCD Module

A LCD(liquid crystal display) receives the character codes each of 8 bits from microcontroller. And is used to display the data information, like which output device i.e. led is on and which one gets off when we send commands through our mobile.

L293D (Motor Driver IC)

This IC is high voltage, high current four channel driver designed to accept DTL or TTL logic. This can provide 600mA output current capability per channel and providing 1.2 peak output current (non repetitive) per channel and also have internal over temperature protection. It consists of a Half H Bridge to provide high current in order to drive motors.

SOFTWARE DEVELOPMENT

TERMINALv1.91b

It is used for testing the GSM. It is one of the useful debugging tools for serial communication applications. By setting various desired parameters like baud rate, data bits, parity bits we can check the communication between GSM and personal computer.

AVR STUDIO 4 and AVR LOADER

AVR Studio is used for coding, and compiling the code. And for burning the program to the microcontroller we have used AVR loader. The basic steps of software development are shown in Figure 2 Coding/debugging and compiling through AVR studio 4, Burning the code to microcontroller using AVR loader + ISP programmer. Microcontroller has been programmed to test the hardware as well to achieve the goal of above application

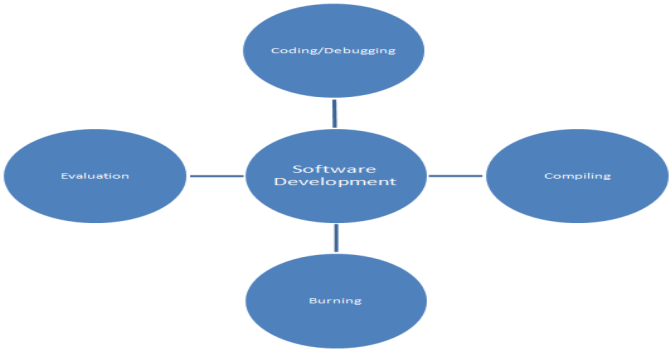

Figure 3: Steps of Programming

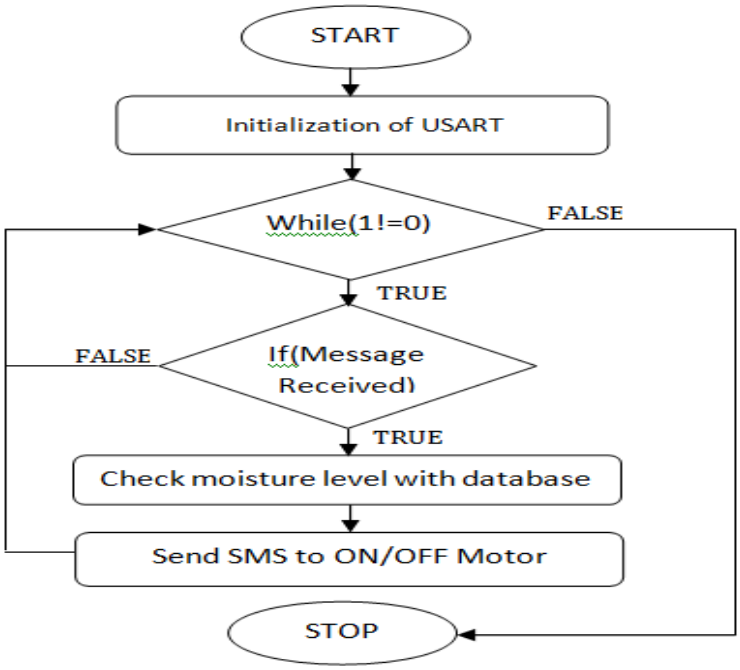

Figure 4: Flow Diagram of the Base Station

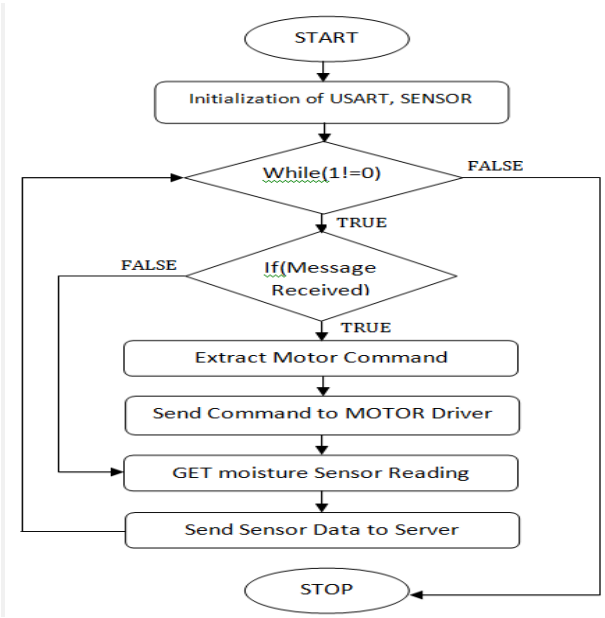

Figure 5: Flow Diagram of the Node Side

CONCLUSIONS AND FUTURE SCOPE

With the help of this system we can change the future of irrigation system. By knowing the moisture content of the soil, water flow can be self controlled by sending commands from the base station. Since this whole system is automated it does not requires consistent monitoring by the user. Thus saving the labour cost. This system helps a lot in saving the wastage of water as well as helps in monitoring and maintaining the level of soil moisture required for proper crops yield. The main advantage is that this system action changes automatically according to the moisture content of the soil. Also in future we can add a feature of getting a SMS in our mobile in case of some malfunction, that system is not working properly. Also we can develop a system to help the illiterate farmers using spoken commands. The spoken

commands can be turned into messages which can be treated as a command messages for the system. We can also add schedules for controlling of the motor according to the user.

Besides irrigation the GSM based controlling can be use in various applications

- It can be used in controlling home appliances like lighting, Fans etc. wirelessly.
- It can help in turning ON/OFF and getting feedback of various devices like door with electric lock, electric heater.
- It can also be use to control hotel power management and industrial automation.
- It can also provide security on detection of intrusion via SMS

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